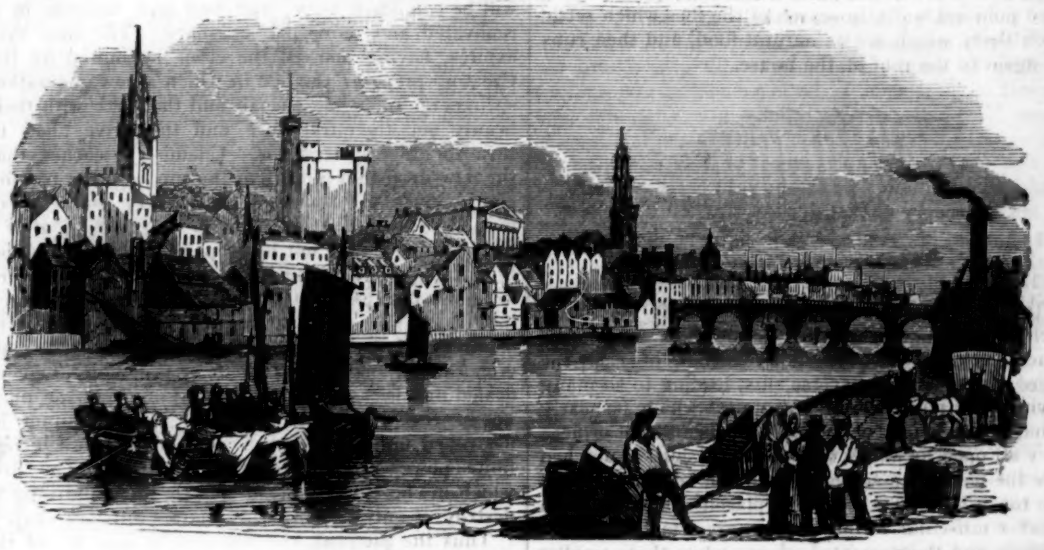
THE
Saturday Magazine.

Nº 416. DECEMBER 29TH, 1838. {PRICE ONE PENNY.

NEWCASTLE-UPON-TYNE, AND THE GREAT NORTHERN COAL-FIELD. No. III.



RIVER VIEW OF NEWCASTLE-UPON-TYNE.

GEOGRAPHICAL SITUATION — POPULATION — THE TYNE—MANUFACTORIES—THE COLLIERIES—RAILWAYS—BRIDGE OVER THE WEAR.

TURNING from the topographical description of Newcastle to its geographical situation, we shall find that few towns in Britain boast such natural advantages for profitable and extensive commerce. It stands 54° 58′ 30″ north latitude, and 1° 37′ 30″ west longitude, reckoned from the meridian of Greenwich. It is 273 miles N.N.W. of London, 117 S.E. of Edinburgh, 56 E. of Carlisle, 76 N.W. by N. of York, and 15 N. of Durham. In 1831 its population was 55,922, and that of Gateshead, 15,177, making a total of 71,099, but the number has increased very considerably since the census was taken. It is the chief port and market of a vast extent of country, there being no sufficient haven for ships of magnitude from the Humber to the Forth, except the Tyne.

This fine river is composed of two main streams, the North and South Tyne, whose confluence is about one mile to the north of Hexham; the former rises on the frontiers of Scotland, the latter on the borders of Cumberland. The Tyne does not become navigable for craft until it reaches Newburn, a village about five miles west of Newcastle. Vessels of 400 tons burden can come up to the town, and at all times ships of 300 tons and upwards may be seen at the quay. From Newcastle the river flows by a circuitous channel to the sea, which it reaches at Tynemouth, previously, however, forming at Shields one of the most convenient tidal and bar harbours which can be found in the world, affording ample accommodation for two thousand sail of ships. On a high rocky point at the extreme of Tynemouth Head are the remains of an ancient monastery, which forms a very conspicuous landmark; and doubtless, in ancient times, many a vow was made to its shrine by the distressed mariners, driven in stormy weather on the iron-bound coast of Northumberland.

The pride which the people of Newcastle take in their noble river, absolutely amounts to a passion; they speak of it with a warmth of affection which strangers can with difficulty comprehend; they celebrate it in their local songs, and a word said in its deprecation is resented as an insult. The keel-men, that is the men employed to carry coals down the river in lighters, which in the North are called keels, are frequently heard singing some of the songs written in honour of their stream. The following strain is sure to be heard by every visiter of Newcastle:

Tyne river running rough or smooth,
Makes bread for me and mine;
Of all the rivers north or south,
There's none like Coaly Tyne.
So here's to Coaly Tyne, my lads,
Success to Coaly Tyne;
Of all the rivers north or south,
There's none like Coaly Tyne.

It is not surprising that the people of Newcastle should be so fondly attached to their noble river, for it is difficult to describe the uninterrupted scene of activity and wealth exhibited along its banks from Newburn to the light-house at North Shields, a distance of seventeen miles. The whole line is a continued series of manufacturing and commercial establishments, many of which well deserve the attention of all who take an interest in mechanical or chemical science. The most remarkable establishments are the crown and plate glass-works, the lead-works, the Tyne iron-works of Lemington; the extensive founderies and engineering establishments of Messrs. Hawks, Losh, and Co., and of Stephenson and Hawthorn, where most of the locomotive engines used on British railways are manufactured. One of these,

now in the course of preparation for the Great Western Railway, is intended to run at the rate of eighty miles per hour, and is capable of being propelled at nearly double that speed. But the most peculiar feature of the landscape is the lofty chimneys of the chemical works, varying from 150 to 300 feet in height, which are constantly emitting copious volumes of smoke. Most of these have been erected since the duty was taken off salt, and are designed to separate the soda in that substance from the muriatic acid, so as to make it fit for the manufacture of soap. This new process has made a complete revolution in the soap trade; the use of kelp and barilla, which previously supplied the soda employed in the manufacture of soap, has almost totally ceased, and the export of soap, soda, and other chemical preparations from Newcastle, is very rapidly increasing, and promises to be a source of vast wealth to the inhabitants.

But the great staple export of Newcastle is coal, and its vast amount would be scarcely credible, were it not proved by official documents.

In 1836 upwards of two and a quarter millions of tons of coals were shipped coastwise from Newcastle; and in 1837, the number of tons was 2,385,192, being an increase of 110,424 tons on the former year. There were also exported to foreign countries and British settlements in 1836, 411,697 tons; and in 1837, 471,150 tons, being an increase of 59,453 tons, and making the total quantity in 1836, 2,686,465 tons, and in 1837, 2,856,342, approaching in round numbers to nearly THREE MILLIONS OF TONS OF COALS PER ANNUM shipped from the river Tyne.

The extent of the Newcastle Coal-field cannot be fixed with precision, but it may be generally described as extending from the Coquet on the north, to the Tees on the south, having an average breadth of twenty-one miles. Vertical sections of the strata differ so much from each other, that the strata of one bed affords no guide to the strata of the next; and the same beds frequently alter so much, that they can hardly be identified at comparatively small distances. The actual quantity of coal in the Newcastle field, does not amount, according to the best calculations, to more than a twenty-fifth part of the whole mass of strata; and of this several smaller seams will not pay the expense of working. The other strata are sandstones of various degrees of hardness, some of which are worked for building-stones. Interstratified with these are the shales, many of which are impregnated with bitumen; others consist of almost pure clay, and some, constituting the floor of certain seams, are used for the manufacture of fire-brick. The following estimate is generally regarded by the geologists in Newcastle as the nearest approximation to the proportions of the different mineral ingredients in the coal field:

The whole mass being divided into 100 parts;	
Of sandstone, or post-stone, more or less indurated, sometimes very fine grained, sometimes extremely coarse, one stratum especially being composed of large pebbles united by a siliceous cement, there are	36 parts.
Of strata in which siliceous earth still predominates, but unmixed with clay, though sufficiently hard to yield sparks on being struck with the miners' tools, there are	44 do.
Of strata that may more strictly be considered argillaceous, including the bituminous shales, &c.	16 do.
Of coal, as explained above, are	4 do.
	100

In the foregoing the ironstone is not noticed, being too small a ratio to the whole to be particularly specified. The iron pyrites met with in coal is employed for the manufacture of copperas; and occasionally small strings of galena occur in the fissures of troubles.

The irregularity of the strata is not the only disadvantage against which those engaged in mining operations have to contend; the seams are often interrupted by dislocations, which are significantly termed faults, hitches, troubles, or dykes; some of these entirely cut off the coal at particular points, either by throwing it out to the surface, or by burying it at hardly practicable depths. These dislocations, however, are not always injurious, for they frequently bring within reach beds of coal which could not have been procured without a very extravagant outlay.

In establishing, or, as it is called in Northumberland, "winning" a colliery, the great object is to sink the pits so as to profit by the natural inclination of the strata, so that future operations may be carried on towards a higher level, and the greater facilities afforded for the descent of water and the transit of coals under ground. Few persons are aware of the vast importance of all questions connected with the drainage in coal-operations. There are many mines from which far more water than coal is raised; but the quantity of water does not increase with the depth of the mine; the principal body of water is met at a distance of not more than forty or fifty fathoms from the surface. The following interesting particulars respecting water in the mines formed part of the communications made to the Geological Section of the British Association, and have been published in Richardson's *Companion to the Visiters of Newcastle.*

Mr. Buddle stated in evidence, before a parliamentary committee, that the weight of water lifted from a mine with which he was connected, was eighteen times that of the coal.

At Friars' Goose colliery the water requires three columns of pumps, sixteen inches and a quarter diameter each, raising upwards of 1000 gallons per minute, or above 6000 tons per day, whilst the weight of coals drawn varies from 250 to 300 tons per day.

During the attempted sinking of Haswell Pit through the sand beneath the magnesian limestone, the engine power employed drew feeders to the amount of 26,700 tons per day!

Yet it is not an uncommon circumstance to find the low main seam worked at a depth of 100 fathoms without any pumping apparatus, when the top feeders have been stopped or intercepted.

The water of the coal measures is often nearly pure, but sometimes it holds foreign ingredients in solution, one of which is sulphate of iron, but the most remarkable is common salt. The origin of the "brine springs," has never been explained. They are much salter than sea-water, and their abundant supply has occasioned the erection of salt works at Walker, Birtley, and Lambton. At St. Lawrence, a feeder has lately been raised from the strata above the low main coal, more than three times salter than the sea.

The mines vary very much in depth; that at Monk-Wearmouth is the deepest in the world. Very inaccurate accounts of it have been published, but the following particulars may be relied on. The shaft is 276 fathoms or 1656 feet in depth, (more than four times the height of St. Paul's in London,) and beneath this is a *sump*, or shaft, of 14 fathoms; making a total depth of 290 fathoms or 1740 feet, very nearly one-third of a mile. The temperature at the bottom in winter, averaged 87°, about 25° below the average surface-temperature. The weight of rope used in drawing the coals is nearly five tons.

The miners or pit-men are generally in comfortable circumstances; they make their engagements for a year, and during that period receive the use of a house and garden in addition to their wages; they are a healthy, long-lived race. From personal observation we feel justified in saying, that the pit-men are

generally an intelligent and moral race; many of them are skilful florists, and all take pride in the neatness of their houses and gardens. It is a common proverb in Newcastle, that no females make so good domestic servants as the daughters of pit-men.

Grindstones are a staple article of export from Newcastle; they are raised chiefly from a range of quarries to the south of Gateshead, and are sent to every quarter of the globe; upwards of 5000 grindstones were exported to foreign countries in the year 1836.

The district around Newcastle may be considered as the native land of railways; they have been used there for nearly two hundred years in conveying coals from the collieries to the river Tyne. The celebrated George Stephenson, so well-known for his success in the construction of locomotive engines, obtained his practical knowledge upon one of the colliery railways at Kellingworth. They have a very singular and picturesque effect when viewed from the Tyne, where they terminate. Their height above the river, and the mechanical contrivances by which the coals brought down in the wagons are shot into the ships, attract the attention of every traveller.

The following public railways are wholly or nearly completed.

1st. The railway from Newcastle to Carlisle. This great work unites the German Ocean to the Irish Sea; the distance is rather more than sixty miles, and it is traversed by the first-class trains in three hours. The road passes up the beautiful valley of the Tyne, and presents to the traveller a succession of picturesque views which cannot be rivalled by any railway in the kingdom. Greater advantages, however, are expected from this railway than it is likely to afford; the port of Carlisle is more than twelve miles distant from the town, and is small, dangerous, and inconvenient; while, as every body knows, the Firth of Solway is one of the most treacherous estuaries to the mariner in the world. It has been, however, proposed to establish a port at Annan Water, on the Scottish side of the Solway, by which the navigation of the worst parts of the Firth would be avoided.

2nd. A railway from North Shields to Newcastle. This very useful and important work exhibits in its execution unrivalled displays of mechanical skill, but none of greater value and importance than the magnificent one at Ouseburn and Willington. It would have been dangerous to construct stone bridges in a country pierced through in every direction by mining operations, and underneath which it was not impossible that more than one shaft might be driven. Iron bridges, however useful for ordinary traffic, would scarcely stand the concussion of locomotive engines coming with the speed of the lightning and the resistless force of the thunderbolt; wood, then, was the only material of which the architect could avail himself, and we shall give an abstract of the process of construction used in these viaducts, furnished by Mr. P. Green to the Mechanical Section of the British Association. The arches are laid on stone piers, and the great object aimed at in their construction, is to produce as great a distribution of stress as possible. The arches consist of three ribs, and every rib is put together with three inch thick deals, in length from twenty to fifty feet, and two deals in width. The first course is composed of two whole deals in breadth, and the next of one whole and two half deals, and this alternation is repeated eight times, layers of brown paper steeped in tar being introduced between each course, so that every rib is sixteen deals in thickness. No two of the horizontal or radiating joints are allowed to come together; the three ribs are connected by diagonal braces and bolts; and the spandrils are strutted in a peculiar manner, which it is difficult to explain by words. The Ouseburn bridge is composed of five noble arches, the three central arches being 116 feet span, the two others at each end 110 feet. The bridge at Willington Dean is composed of seven arches, the five middle ones being 120 feet span, and the two end ones 115 feet. The height of this bridge from the bottom of the dean or ravine, to the roadway, is 82 feet, and the entire length 1040 feet.

3rd. The Brandling Junction Railway, so named from its projector and principal manager, R. W. Brandling, Esq., is designed to unite South Shields and Monk-Wearmouth, with the Newcastle and Carlisle railway. In connexion with this we may mention the Stanhope and Tyne railway, intended to bring the mineral produce of the great coal field in the county of Durham, from the south side of the river Wear to the harbour of the Tyne, where the company's dock property is of the most extensive and valuable description. The Stanhope Company can produce at their docks seventeen shipping berths, at which more than half a million chaldrons of coal could be annually put on board. In order to form a communication with the South Durham coal-field, it was necessary to throw a bridge over the Wear, and this effort of human skill is one of the most surprising specimens of bridge architecture in the world.

The arch over the Wear is 160 feet span; the next arch on the north side 144 feet; and the two others each 100 feet. The length of the entire bridge is 810 feet 9 inches. Its width within the parapet walls 21 feet; and its height from the water 130 feet. On the bridge a double line of rails are laid, and there is on each side a flagged footway. The foundations, both from the abutments and piers are based upon the solid rock. The stone with which this gigantic fabric has been constructed is an excellent well-coloured free stone from Painshaw Quarry in the immediate neighbourhood, except the quoins of the two large arches, which are of granite; and though elegance and beauty are combined in all parts of the design, the structure presents altogether a degree of substantiality surprisingly formidable.

This bridge was erected by Mr. Gibb, of Aberdeen; it was completed on Wednesday, the 27th of June; and in commemoration of the coronation of her Majesty, was named Victoria Bridge.

Much has been said, especially in Scotland, of a railway from Newcastle to Edinburgh; but the project has not yet met with such support in this district, as to afford any hope of its being speedily carried into effect. It is, indeed, very probable that the projected railroad from Carlisle to Glasgow will supersede its necessity; for the railroad between Lancaster and Liverpool is nearly completed, and a railroad from Lancaster to Carlisle, a distance of not more than sixty miles, would at once bring Scotland and the North of England into the line with Liverpool, Manchester, Birmingham, and London. The only difficulty, the intervention of Shap-Fells, it has been recently ascertained, may be surmounted, without the necessity of a tunnel or even a very deep cutting. Should this work ever be completed, the beautiful lakes of Westmoreland and Cumberland will be brought within a short day's journey of the citizens of London, and a country scarcely inferior in picturesque interest to Switzerland, and far superior to it in its romantic and historical associations, opened to the humblest class of tourists.

THE PRIMROSE. (*Primula.*)

. . . . And here's the meek
And soft-eyed Primrose.—HURDIS.

Woods and groves are of thy dressing,
Hill and dale doth boast thy blessing.—MILTON.

THIS delicately perfumed, and modestly coloured early blossom, is considered the emblem of early youth, and represents the age between child and womanhood.

. . . . . Pale Primroses,
That die unmarried, ere they can behold
Bright Phœbus in his strength.—*Winter's Tale.*

The generic name of this flower is derived from *primus*, it being one of the earliest flowers of the spring, and from thence the English name of Primrose, the French *Primevère*, and the Italian *Primavera*. The German name *Frühlings blume* has a similar signification. As we enumerate twenty distinct species of *Primula*, we shall confine ourselves to the *Primula vulgaris*, or common Sulphur-coloured Primrose, which has lent its name to distinguish a delicate pale yellow colour, slightly tinted with green.

In tracing back the nativity of flowers, we are greatly assisted by the mythological writings of the ancients; for without these records we should have pronounced them all as being the children of Nature; and the relationship which this favourite flower bears to the gods would have remained unknown, as well as the history of its origin. The Primrose was anciently called Paralisos, after the name of a beautiful youth who was the son of Priapus and Flora, and who died of grief for the loss of his betrothed Melicerta, but was preserved by his parents by being metamorphosed into this flower, which has since divided the favours of the poets with the Violet and the Rose. Clare says—

O, who can speak his joys when Spring's young morn
From wood and pasture opened to his view;
When tender green buds blush upon the thorn,
And the first primrose dips its leaves in dew.

And while he plucked the Primrose in its pride,
He pondered o'er its bloom 'tween joy and pain;
And a rude sonnet in its praise he tried,
Where nature's simple way the aid of art supplied.

I did the same in April time,
And spoilt the Daisy's earliest prime;
Robbed each Primrose root I met,
And ofttimes got the root to set;
And joyful home each nosegay bore,
And felt—as I shall feel no more—*Village Minstrel.*

To crop the Primrose of the plains!
Does she not sweets in each fair valley find,
Lost to the sons of power, unknown to half mankind!
SHENSTONE.

And lanes in which the Primrose ere her time
Peeps through the moss that clothes the hawthorn root,
Deceive no student. Wisdom there and truth,
Not shy, as in the world, and to be won
By slow solicitation, seize at once
The roving thought, and fix it on themselves.—COWPER.

As some wayfaring man passing a wood
Goes jogging on, and in his minde nought hath,
But how the Primrose finely strow the path.
W. BROWNE.

There are some flowers that contribute to dispose us to a pensive or melancholy strain wherever we meet with them; whilst others seem equally to exhilarate the spirits and enliven the ideas. The colour and character of the flower may, in some degree, assist to make this impression; but it must principally be attributed to the remarks of the poets, as

Bring the rathe Primrose that forsaken dies.—*Lycidas.*

Sweet as the Primrose peeps beneath the thorn.

She is the rose, the glory of the day,
And mine the Primrose in the lowly shade:
Mine, oh! not mine; amisse I mine did say:
Not mine, but his, which mine awhile her made;
Mine to be his, with him to be for aye.
O that so faire a flowre so soon should fade,
And through untimely tempest fall away!
She fell away in her first age's spring,
Whilst yet her leafe was greene and fresh her rinde,
And whilst her branch fair blossomes foorth did bring,
For age to dye is right, but youth is wrong;
She fell away like fruit blown with the winde,
Weep, Shepheard! weep, to make my undersong.
SPENSER.

Shakspeare makes it a funeral flower for youth—

. . . . With fairest flowers,
Whilst summer lasts, and I live here, Fidele,
I'll sweetch thy sad grave: Thou shalt not lack
The flower that's like thy face, pale Primrose.—*Cymbeline.*

Although every lover of nature hails with pleasure the first appearance of the pale Primrose, seated on the hazel bank, surrounded by its puckered leaves, yet it fails to give those joyous sensations which arise at the first sight of the meadow "gay with gaudy Cowslips drest." The latter flower as forcibly brings to mind the frolics of our childhood, as the former reminds us of past friends and rural walks; for the soft tints of the Primrose, like the mild beams of the moon, seem to invite us on to moral reflections and quiet contemplation.

The Primrose is a native of most parts of Europe, always seeking the partial shade of hedge-rows, the banks of sheltered lanes, and the borders of woods or coppices, and is but seldom found spangling the open meadow, like its relative the Cowslip. From this we should learn to place it on the banks of our wilderness walks, and to scatter it thickly beneath the trees of the shrubbery. It will grow in almost any soil, but thrives most on a clayey bank. When transplanted in the Spring, it receives a check to its flowering, which often causes it to blossom freely in the Autumn.

The variety of the common Primrose, with double flowers of a lilac colour, forms a most agreeable contrast with the pale Primrose of the woods. The common Sulphur-coloured Primrose frequently changes its colour into a pale dingy red by cultivation; and we have sometimes met with it growing naturally of this colour, occasioned by some accidental circumstance analogous to cultivation, as either by the seed falling on strong manure, or rich earth being scattered over the plant. The medicinal properties of the Primrose are the same as those of the Cowslip, but of a weaker quality. We proceed to that beautiful and varied kind of Primrose so much esteemed in the gardens of florists under the name of

POLYANTHOS.

. . . . . Polyanthus of unnumbered dyes.—THOMSON.

THIS beautiful variety of *Primula* derives its name from the Greek words *polus*, many, or much, and *anthos*, a flower, as the Polyanthos, like the Auricula, produces an umbel of many flowers on one common scape or stem; and on this account we consider it to be rather a variety of the *Primula elatior*, Oxlip, than that of the common Primrose, although Linnæus asserts that the peduncles in the common Primrose spring from a scape, which being so short is concealed among the leaves. Amongst a number of wild Primroses that were planted in Dr. Buxton's garden, at Maize Hill, near Greenwich, some of them produced flowers with a scape, and were thus transformed into Polyanthoses, retaining the colour of the Field Primrose.

The author has been a frequent planter of this

flower, but never observed this change, although the change of colour from the common sulphur to a red tint was frequent. It is probable that the Polyanthos may have sprung from both the Primrose and the Oxlip. Experience proves it to be a permanent variety; for however Nature sports with its tints, we have not known it return to either the common Primrose or the Oxlip.

The Polyanthos, which has been so much improved by cultivation during the last century, may justly dispute the prize of beauty with any European flower, when we take into account the variety and richness of its colouring, the grace and elegance of its form, its mild and agreeable odour, that has never been known to offend: its easy propagation, hardy nature, and early time of flowering, make it a welcome inmate in every flower-garden. and in no part of the world is it so successfully cultivated as in England, particularly by the zealous florists of Lancashire and Cheshire, who have, in the instance of this flower, left the Dutch bloemist considerably in the background. The neighbourhood of Manchester and Macclesfield is justly celebrated for producing the finest specimens of this flower, and in these manufacturing districts the criterion of a fine Polyanthos is ascertained with as narrow a scrutiny as the sportsman regards his pointer or setter dog.

The stem of a perfect flower must be strong, erect, and elastic, and of sufficient height to support the umbel or bunch of flowers above the puckered foliage of the plant. The footstalks of each separate flower should also be strong and elastic, and of a length proportioned to the size and quantity of the pipes; which should not be less than seven in number, that the bunch may be round, close, and compact. Maddox says, "the tube of the corolla above the calyx should be short, well filled with the anthers or summits of the stamens, and terminate fluted, rather above the eye. The eye should be round, of a bright clear yellow, and distinct from the ground colour; the proportions of a fine flower are that the diameter of the tube be one part, the eye three, and the whole pip six, or nearly so. The ground colour is most admired when shaded with a light and dark rich crimson, resembling velvet, with one mark or stripe in the centre of each division of the limb, bold and distinct, from the edging down to the eye, where it should terminate in a fine point. The pips should be large, quite flat, and as round as may be consistent with their peculiar beautiful figure, which is circular, excepting those small indentures between each division of the limb, which divide it into five heart-like segments. The edging should resemble a bright gold hue, bold, clear, and distinct, and so nearly of the same colour with the eye and stripes as scarcely to be distinguished; in short, the Polyanthos should possess a graceful elegance of form, a richness of colouring and symmetry of parts, not to be found united in any other flower."

A connoisseur in Polyanthoses scarce deigns a look of approbation on a pin-eyed flower, however brilliant its corolla. We think this distinction too refined, having frequently met with these outcasts of the garden that ought to have filled conspicuous situations, from the gaiety of their colours. The difference of the Rose and the pin-eyed flower consists in the anthers of the former being fixed near the top of the tube, and the pistil, being shorter than the tube, is therefore not seen; whereas in the pin-eyed, the pistil is so long as to reach the top of the tube, and the anthers are attached to the middle of the pipe, which swells out where the anthers are fixed.

Polyanthoses are increased by dividing the roots, or by slips, which should be taken off in the autumn. Indeed at this season all the roots should be taken up, divided, and planted into fresh earth; for, if suffered to remain over one or two years, they will degenerate and lose the greater part of their beauty. These favourite flowers of the Spring should be planted about six inches apart, and if about ten or twelve plants, all of the same variety, be placed in each clump, the effect will be more agreeable than when they are either planted singly or in regular beds.

The Polyanthos, from its hardy nature, will grow in almost any soil or situation; but to increase the size of the flowers, which forms one of the great beauties of the plant, care should be taken to give them such a mixture of earth as is most adapted to force them. Mr Hogg, who has grown these flowers in great perfection, says the Polyanthos requires a much greater portion of sandy loam than the Auricula, a very small quantity of rotten dung, and a little leaf mould, peat or heath-earth mixed with the loam. Justice recommends the following proportions: four parts of fine hazelly loam from a pasture, three parts of well-rotted cow-dung, or two of leaves that have turned to mould, and one part of fine white sand, well mixed together.

We recommend a border or situation in the garden for the Polyanthos that is shaded by shrubs from the afternoon sun: there let holes be dug about five inches deep, and of the size intended for the clumps, which should be filled up with the compost, and watered well the day before the roots are planted, so that it may not sink below the level of the borders, after the plants are put into the earth.

It is observed that plants which are raised from seed, flower much better than those taken from old roots; therefore it is desirable to save the seeds annually from the finest plants; and as it will be observed that some of the capsules ripen the seed much earlier than others, it is advisable to cut those off, and preserve the seed in the capsule, in a shallow drawer, placed in a dry and sunny situation, until the whole is ripe, which is usually found to be about the end of June. This seed should be sown under a wall or hedge, in a north aspect, taking care not to cover it too deep with earth, and the young plants may be transplanted about the same time in the following year, giving them gentle waterings in dry seasons. Some florists prefer keeping the seed out of the ground until December, and then sowing it in boxes, which are placed in situations to receive the morning sun, only, and particularly when the young plants appear, as one whole day's sun would entirely destroy them.

Snails and slugs commit great depredations on the Polyanthos plants during the spring months; they should therefore be carefully examined early in the morning, at the time these depredators make havoc. But a more dangerous enemy often attacks this plant during the summer months, and from its minuteness often destroys a whole plantation, before the cause is ascertained. This is the little red spider *acarus*, which forms its web on the under side of the leaves, where it multiplies with such rapidity as soon to devour and poison the whole plant, although the insect itself is scarcely visible without a magnifying glass. The first effect of its attack is observed by the leaves becoming yellow and spotted. When this is observed, the plants affected should be taken up, and soaked for two or three hours in a strong infusion of tobacco-water, and then replanted in a fresh soil, or compost, but by no means in the same situation, as there would be danger of there being many of these little spiders

left on the ground, which would immediately return to the plants. Maddock observes that "the red spider seldom attacks such plants as are in a state of vigour, or when the weather is cold and wet; it generally commences its depredations in the early part of summer, and continues them as long as the heat and dryness of the weather favour its existence: the juices also of the plants being then more viscous and saccharine, afford it more suitable nourishment than at any other season."—PHILLIPS' *Flora Historica.*

PROGRESS OF THE ARTS AND SCIENCES.

PERSONS in general look at the magnificent fabric of civilized society as the result of the accumulated labour, ingenuity, and enterprise of man, through a long course of ages, without attempting to define what has been owing to the different branches of human industry and science; and usually attribute to politicians, statesmen, and warriors, a much greater share than really belongs to them in the work: what they have done is in reality little. The beginning of civilization is the discovery of some useful arts, by which men acquire property, comforts, or luxuries. The necessity or desire of preserving them leads to laws and social institutions. The discovery of peculiar arts gives superiority to particular nations; and the love of power induces them to employ this superiority to subjugate other nations, who learn their arts, and ultimately adopt their manners; so that in reality the origin as well as the progress and improvement of civil society, is founded in mechanical and chemical inventions. No people have ever arrived at any degree of perfection in their institutions who have not possessed in a high degree the useful and refined arts. The comparison of savage and civilized man, in fact, demonstrates the triumph of chemical and mechanical philosophy, as the causes not only of the physical, but ultimately even of moral improvement.

Look at the condition of man in the lowest state in which we are acquainted with him. Take the native of New Holland, advanced only a few steps above the animal creation, and that principally by the use of fire; naked, defending himself against wild beasts, or killing them for food, only by weapons made of wood hardened in the fire, or pointed with stones or fish-bones; living only in holes dug out of the earth, or in huts rudely constructed of a few branches of trees covered with grass; having no approach to the enjoyment of luxuries, or even comforts; unable to provide for his most pressing wants; having a language scarcely articulate, relating only to the great objects of nature, or to his most pressing necessities or desires, and living solitary or in single families, unacquainted with religion, government, or laws, submitted to the mercy of nature or the elements. How different is man in his highest state of cultivation; every part of his body covered with the products of different chemical and mechanical arts, made not only useful in protecting him from the inclemency of the seasons, but combined in forms of beauty and variety; creating out of the dust of the earth, from the clay under his feet, instruments of use and ornament; extracting metals from the rude ore, and giving to them a hundred different shapes for a thousand different purposes; selecting and improving the vegetable productions with which he covers the earth; not only subduing, but taming and domesticating the wildest, the fleetest, and the strongest inhabitants of the wood, the mountain, and the air; making the winds carry him on every part of the immense ocean; and compelling the elements of air, water, and even fire, as it were, to labour for him; concentrating in small space materials which act as the thunderbolt, and directing their energies so as to destroy at immense distances; blasting the rock, removing the mountain, carrying water from the valley to the hill; perpetuating thought in imperishable words, rendering immortal the exertion of genius, and presenting them as common property to all awakening minds,—becoming, as it were, the true image of divine intelligence, receiving and bestowing the breath of life in the influence of civilization. * * * *

The rendering skins insoluble in water, by combining with them the astringent principle of certain vegetables, is a chemical invention, and without leather our shoes, our carriages, our equipages, would be very ill made; the bleaching and dyeing of wool, and silk, cotton, and flax, are chemical processes, and the conversion of them into different clothes is a mechanical invention. The working of iron, copper, tin, and lead, and the other metals, and the combining them in different alloys, by which almost all the instruments necessary for the turner, the joiner, the stone-mason, the ship-builder, and the smith, are made, are chemical inventions. Even the press, to the influence of which I am disposed to attribute so much, could not have existed in any state of perfection, without a metallic alloy. The combining of alkali and sand, and certain clays and flints together to form glass and porcelain, is a chemical process: the colours which the artist employs to frame resemblances of natural objects, or to create combinations more beautiful than ever existed in nature, are derived from chemistry. In short, in every branch of the common and fine arts, in every department of human industry, the influence of this science is felt; and we may find in the fable of Prometheus taking the flame from heaven to animate his man of clay, an emblem of the effects of fire in its application to chemical purposes in creating the activity and almost the life of civil society. * * * *

I will readily allow that accident has had much to do with the origin of the arts, as with the progress of the sciences. But it has been by scientific processes and experiments that these accidental results have been rendered really applicable to the purposes of common life. Besides, it requires a certain degree of knowledge and scientific combination to understand and seize upon the facts which have originated in accident. It is certain that in all fires alkaline substances and sand are fused together, and clay hardened; yet for ages after this discovery of fire, glass and porcelain were unknown, till some men of genius profited by scientific combination, often observed but never applied.

It suits the indolence of those minds which never attempt anything, (and which, probably, if they did attempt anything, would not succeed,) to refer to accident that which belongs to genius. It is sometimes said by such persons that the discovery of the law of gravitation was owing to accident; and a ridiculous story is told of the falling of an apple, as the cause of this discovery. As well might the invention of fluxions, or the architectural wonders of the dome of St. Peter's, or the miracles of art, the St. John of Raphael, or the Apollo Belvidere, be supposed to be owing to accidental combinations. In the progress of an art from its rudest to its more perfect state, the whole process depends upon experiments. Science is, in fact, nothing more than the refinement of common sense making use of facts already known, to acquire new facts. Clays which are yellow are known to burn red; calcareous earth renders flint fusible,—

the persons who have improved earthenware made their selections accordingly. Iron was discovered at least one thousand years before it was rendered malleable; and from what Herodotus says of this discovery, there can be little doubt that it was developed by a scientific worker in metals. Vitruvius tells us that the ceruleum, a colour made of copper, which exists in perfection in all the old paintings of the Greeks and Romans, and on the mummies of the Egyptians, was discovered by an Egyptian king. There is, therefore, every reason to believe that it was not the result of accidental combination, but of experiments made for producing or improving colours.

Amongst the ancient philosophers many discoveries are attributed to Democritus and Anaxagoras; and, connected with chemical arts, the narrative of the inventions of Archimedes alone, by Plutarch, would seem to show how great is the effect of science in creating power. In modern times the refining of sugar, the preparation of nitre, the manufacturing of acids, salts, &c., are all results of pure chemistry. Take gunpowder as a specimen: no person but a man infinitely diversifying his processes and guided by analogy, could have made such a discovery. Look into the books of the alchemists, and some idea may be formed of the effects of experiments. It is true these persons were guided by false views, yet they made most useful researches; and Lord Bacon has justly compared them to the husbandman, who, searching for an imaginary treasure, fertilized the soil. They might likewise be compared to persons, who, looking for gold, discover the fragments of beautiful statues, which separately are of no value, and which appear of little value to the persons who found them; but which, when selected and put together by artists, and their defective parts supplied, are found to be wonderfully perfect, and worthy of conservation.

Look to the progress of the arts since they have been enlightened by a *system* of *science*, and observe with what rapidity they have advanced. Again, the steam-engine in its rudest form was the result of a chemical experiment. In its refined state it required the combinations of all the most recondite principles of chemistry and mechanics; and that excellent philosopher who has given this wonderful instrument of power to civil society was led to the great improvements he made by the discoveries of a kindred genius, on the heat absorbed when water becomes steam, and of the heat evolved when steam becomes water. Even the most superficial observer must allow in this case a triumph of science; for what a wonderful impulse has this invention given to the progress of the arts and manufactures in our country! how much has it diminished labour! how much has it increased the real strength of the country! Acting, as it were, with a thousand hands, it has multiplied our active population; and receiving its elements of activity from the bowels of the earth, it performs operations which formerly were painful, oppressive, and unhealthy to the labourers, with regularity and constancy, and gives security and precision to the efforts of the manufacturer. And the inventions connected with the steam-engine, at the same time that they have greatly diminished labour of body, have tended to increase power of mind and intellectual resources. Adam Smith well observes that manufacturers are always more ingenious than husbandmen; and manufacturers who use machinery will probably always be found more ingenious than handicraft manufacturers.

Porcelain has been spoken of as a result of accident. The improvements invented in this country, as well as those made in Germany and France, have been entirely the result of chemical experiments. The Dresden and the Sevres manufactures have been the work of men of science, and it was by multiplying his chemical researches that Wedgewood was enabled to produce, at so cheap a rate, those beautiful imitations, which, while they surpass the ancient vases in solidity and perfection of material, equal them in elegance, variety, and tasteful arrangement of their forms. In another department, the use of the electrical conductor was a pure scientific combination, and the sublimity of the discovery of the American philosopher was only equalled by the happy application he immediately made of it. In our own times it would be easy to point out numerous instances in which great improvements and beneficial results connected with the comforts, the happiness, and even life of our fellow creatures, have been the results of scientific combinations; but I cannot do this without constituting myself a judge of the works of philosophers who are still alive, whose researches are known, whose labours are respected, and who will receive from posterity praises that their contemporaries hardly dare to bestow upon them.—Sir Humphry Davy.

In young minds there is commonly a strong propensity to particular intimacies and friendships. Youth, indeed, is the season when friendships are sometimes formed, which not only continue through succeeding life, but which glow to the last, with a tenderness unknown to the connexions begun in cooler years. The propensity, therefore, is not to be discouraged, though, at the same time, it must be regulated with much circumspection and care.

Too many of the pretended friendships of youth are mere combinations in pleasure. They are often founded on capricious likings, suddenly contracted and as suddenly dissolved. Sometimes they are the effect of interested complaisance and flattery on the one side, and of credulous fondness on the other. Such rash and dangerous connexions should be avoided, lest they afterwards load us with dishonour.

We should ever have it fixed in our memories, that by the character of those whom we choose for our friends, our own is likely to be formed, and will certainly be judged of by the world. We ought, therefore, to be slow and cautious in contracting intimacy; but when a virtuous friendship is once established, we must ever consider it as a sacred engagement.—Blair.

Legitimate reasoning is impossible without severe thinking, and thinking is neither an easy nor an amusing employment. The reader who would follow a close reasoner to the summit and absolute principle of any one important subject, has chosen a chamois-hunter for his guide. Our guide will indeed take us the shortest way, will save us many a wearisome and perilous wandering, and warn us of many a mock road that had formerly led himself to the brink of chasms and precipices, or at least in an idle circle to the spot from whence he started. But he cannot carry us on his shoulders; we must strain our own sinews as he has strained his, and make firm footing on the naked rock for ourselves, by the blood of toil from our own feet.—Coleridge.

To instruct mankind in things the most excellent, and honour and applaud those learned men who perform this service with industry and care, is a duty, the performance of which must procure the love of all good men.—Xenophon.

For general improvement, a man should read whatever his immediate inclination prompts him to; though, to be sure, if a man has a science to learn, he must regularly and resolutely advance. What we read with inclination makes a stronger impression. If we read without inclination, half the mind is employed in fixing the attention, so there is but half to be employed on what we read. If a man begins to read in the middle of a book, and feels an inclination to go on, let him not quit it to go to the beginning. He may, perhaps, not feel again the inclination.—Johnson.

GOLD-LEAF BEATING.

Fig. 1.

The extraordinary malleable nature of Gold, which appears to have been known from the remotest antiquity *, together with its power of resisting the action of the atmosphere and of acids, have brought this valuable metal into more common use than its extreme rarity would otherwise permit. To render it available for the purpose of covering various substances, it is beaten into very thin leaves. The art of the gold-beater requires very great practice, and considerable manual dexterity, and in all its operations the greatest care is necessary to ensure the uniform thickness of the leaf when it is finished

The gold, which must be perfectly pure, is first cast into small bars, each weighing two ounces, of about three-quarters of an inch in width. The first operation is to extend these bars of gold in length, and to reduce them in thickness, by passing them repeatedly through a flatting mill, consisting of two equal-sized and highly-polished steel rollers; by this means the bar is extended in length, and necessarily reduced in thickness. The process of rolling hardens the gold, and to restore its malleability it is frequently heated to redness. The operation of rolling is continued until the riband of gold is so much reduced in thickness, that a square inch will weigh about six grains and a half. The first act of the gold-beater is to cut these ribands into pieces about an inch square. About 150 of these square pieces of gold are placed between as many of vellum about four inches square; the gold is placed as nearly as possible in the centre of each leaf, and about twenty extra pieces of vellum are placed at the top and bottom of the pile; the whole packet of leaves and gold are then strapped together to keep each in its place in the manner shown in the engraving. Fig. 2 is a band of strong parchment, into which, as shown in fig. 3, the packet of leaves is forced; this band or

Fig. 2.

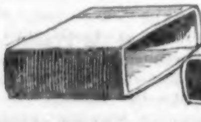
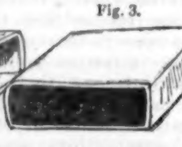


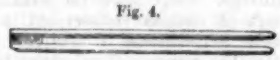
Fig. 3.



belt thus confines them in one direction: the packet thus partially confined is then forced into another strap of the same description, which crosses the first at right angles, and completes the confinement of the leaves.

The reduction of the gold squares in thickness is then effected by means of a hammer with rather a rounded face, about four inches in diameter, weighing from fifteen to sixteen pounds, and fixed to a short handle. The beating is performed on a block of black marble, or other hard stone (see fig. 1), about nine inches square and of considerable weight, the heavier the better: this marble block is embedded in a framework of wood about two feet square, its upper surface level with the top of the stone. Round three sides of this wooden frame a narrow ledge is raised, while the fourth side, opposite which the workman sits, is furnished with a leather apron, which the gold-beater places round him when at work, for the purpose of receiving any pieces of gold that may escape from the packet. The workman strikes fairly upon the middle of the packet, which he frequently turns over to beat the opposite side, but this he does in the interval between two strokes, without losing his blow. He keeps up a constant beating, and when fatigued with one hand, he dexterously changes the hammer to the other, whilst it is elevated in the air, and without any loss of time or force. The packet is every now and then bent or rolled between the hands of the workman, to give more freedom to the gold as it extends; and it is several times, during the operation, opened, to see how the work proceeds, and to shift the leaves which were in the centre to the outside of the packet. The beating is continued until the gold squares are nearly the size of the skins of vellum between which they are placed. They are then taken out, and each square is cut into four pieces by drawing a knife across it in two directions; these squares are again made up into packets, but instead of being placed between vellum as in the first instance, a substance called *Gold-beaters' skin* is employed, which is prepared from the intestines of an ox, made into pieces about five inches square. A smaller hammer is now used, and the beating is continued, the packet being more frequently rolled in the workman's hands, on account of the thin state to which the gold is now reduced. When the gold leaves by this second beating have reached the size of the gold-beater's skin, they are again cut into four, and again subjected to the power of the hammer: by this means they are extended to 192 times their original surface, each ounce of gold thus covering the space of one hundred square feet: but this is not by any means so thin as they may be made, for it is very practicable to extend an ounce to 160 square feet. The gold leaves are now cut exactly square by means of a small tool formed of two narrow slips of ivory fixed in a frame at a distance from each other equal to the width of the leaf, being lifted from the cushion on which they are cut by means of a pair of tweezers, fig. 4. They are then

Fig. 4.



made up into books, each containing twenty-five leaves of gold; the books are made of thin paper rubbed over with red chalk, to prevent the gold adhering.

* Among the remains of Egyptian art which have been handed down to the present day, many specimens of articles covered with Gold leaf are found.

Every human creature is sensible of the propensities to some infirmity of temper, which it should be his care to correct and subdue, particularly in the early period of life; else, when arrived at a state of maturity, he may relapse into those faults which were originally in his nature, and which will require to be diligently watched and kept under, through the whole course of life; since nothing leads more directly to the breach of charity, and to the injury and molestation of our fellow-creatures, than the indulgence of an ill temper.—Blair.

LONDON:
JOHN WILLIAM PARKER, WEST STRAND.
Published in Weekly Numbers, price One Penny, and in Monthly Parts price Sixpence.
Sold by all Booksellers and Newsvenders in the Kingdom.